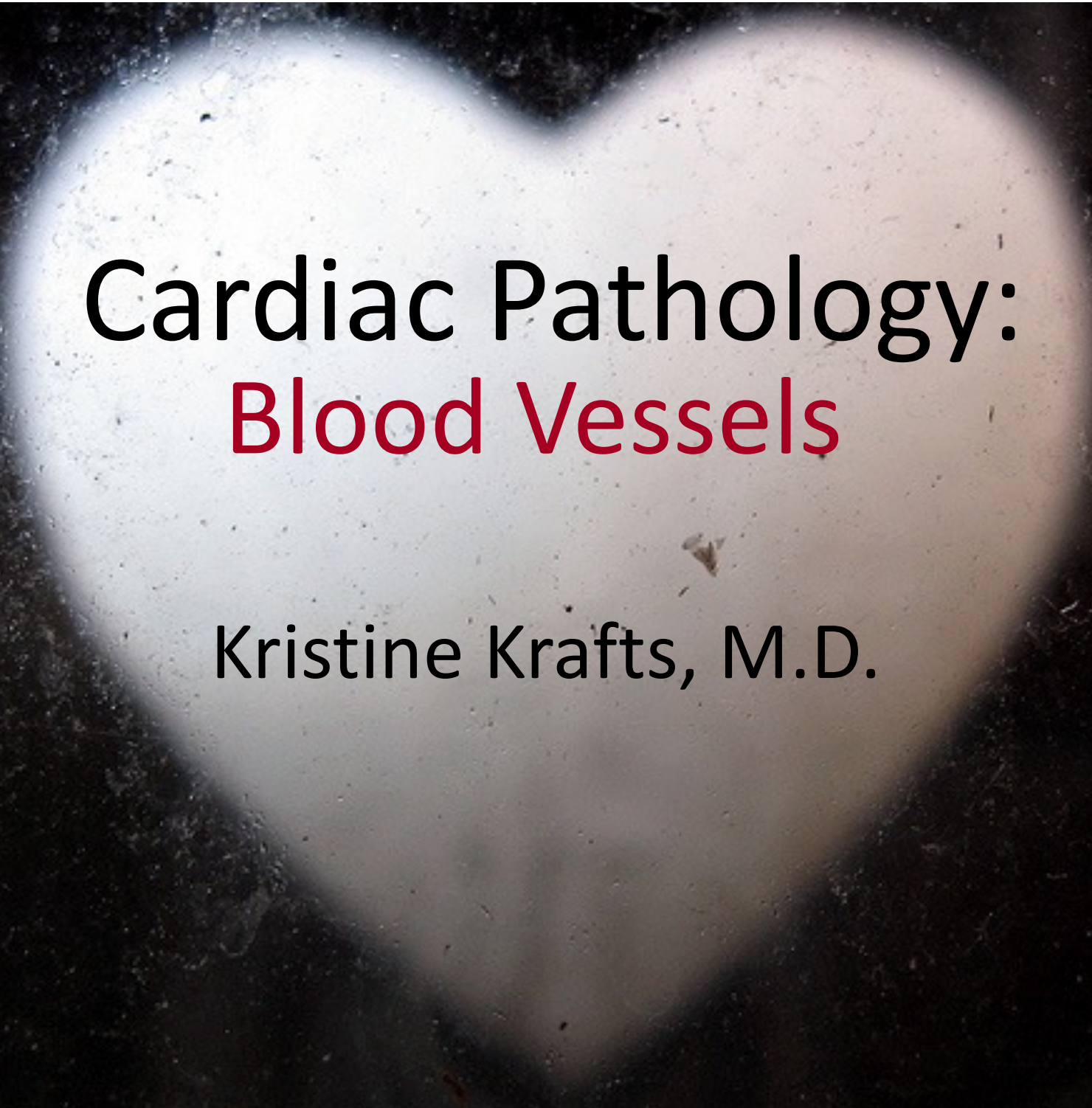




Cardiac Pathology: Blood Vessels

Kristine Krafts, M.D.

Blood Vessels Lecture Objectives

- List the major (modifiable and unmodifiable) and minor risk factors for atherosclerosis.
- Describe where (which type of blood vessel, and which layer?) atheromas occur, and outline the main steps in their development.
- What's so bad about atherosclerosis (list the three outcomes when an advanced/vulnerable plaque progresses).
- Describe how hypertension is categorized and know which type of hypertension is the most common.

Blood Vessels Lecture Objectives

- What are the possible causes and outcomes of essential hypertension?
- Describe what an aneurysm is and list the risk factors and potential outcomes of an abdominal aortic aneurysm.
- Describe what an aortic dissection is, list the most commonly-affected patient, and describe its potential outcomes.
- Describe the typical age and sex in which Takayasu arteritis occurs. List where in the body this arteritis occurs, and explain how that leads to its typical symptoms.

Blood vessels Lecture Objectives

- Describe the typical patient age and presentation of Kawasaki syndrome. What are the possible outcomes of this syndrome, and how is it usually treated?
- Compare and contrast the presentation and location of capillary hemangioma and pyogenic granuloma. Why is pyogenic granuloma a stupid name for this disease?
- Describe what cell Kaposi sarcoma originates from; list the four types, and explain its possible outcomes.
- Describe what cell angiosarcoma originates from; list the most common locations in which it occurs, list some risk factors, and describe its prognosis.

Cardiac Pathology Outline

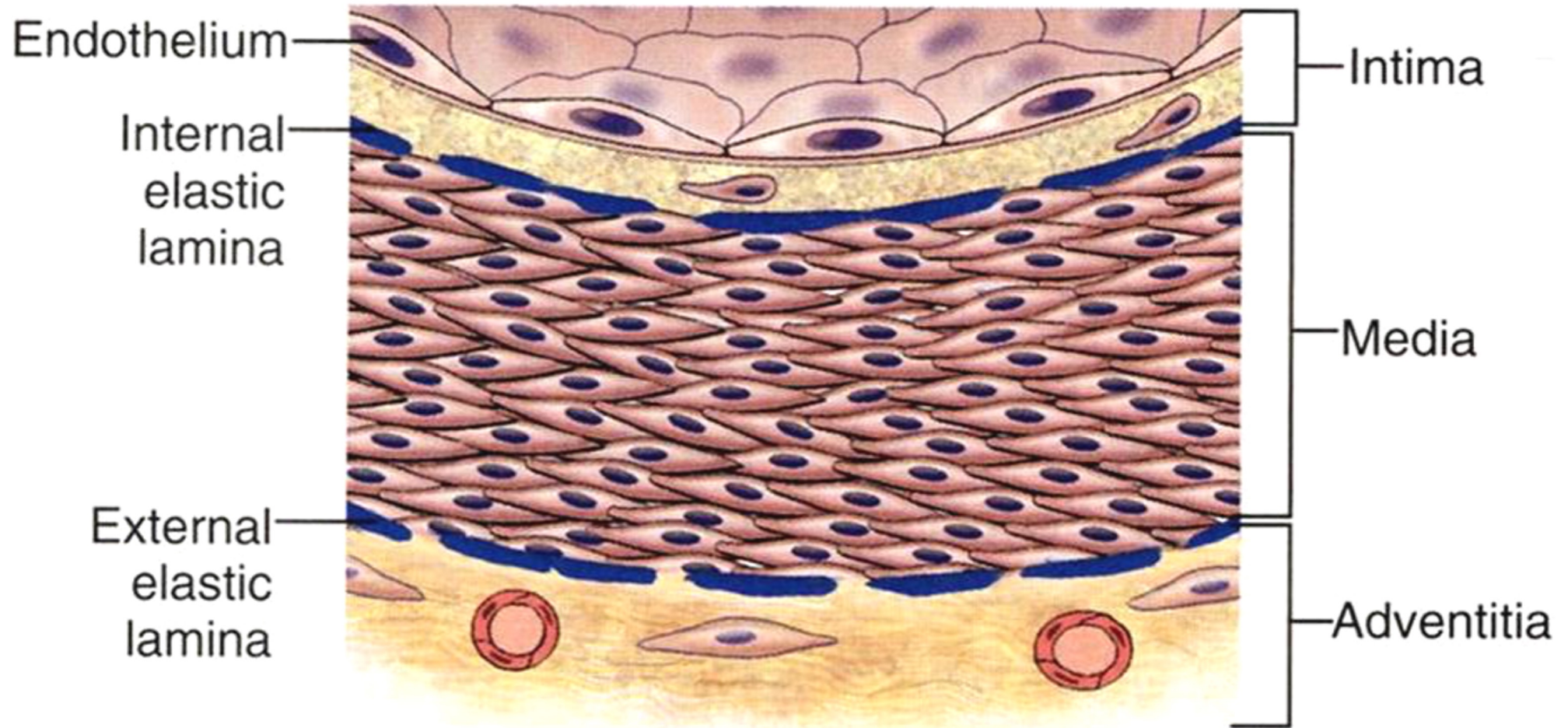
- Blood Vessels
- Heart I
 - Heart Failure
 - Congenital Heart Disease
 - Ischemic Heart Disease
- Heart II
 - Valvular Heart Disease
 - Cardiomyopathies
 - Tumors

Cardiac Pathology Outline

- Blood Vessels
 - Atherosclerosis
 - Hypertension
 - Aneurysms
 - Vasculitis
 - Tumors

Cardiac Pathology Outline

- Blood Vessels
 - Atherosclerosis



Normal blood vessel

Atherosclerosis

- Characterized by atheromas (plaques)
- Half of deaths in US!
- Most common cause of myocardial infarction
- Most common cause of cerebral infarction

Major Risk Factors for Atherosclerosis

Non-modifiable

- Increasing age
- Male sex*
- Family history
- Genetic abnormalities

Modifiable

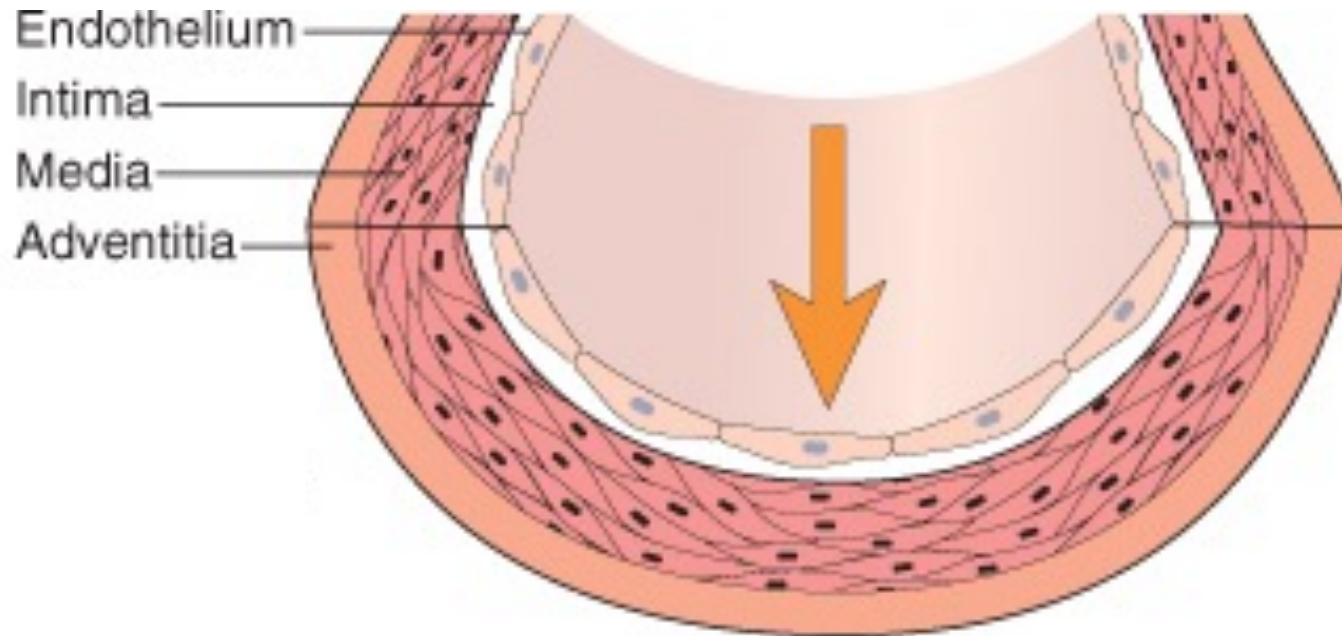
- Hyperlipidemia
- Hypertension
- Cigarette smoking
- Diabetes

* Sort of. MI is uncommon in premenopausal women, but after menopause, incidence in women exceeds that in men.

Other Risk Factors for Atherosclerosis

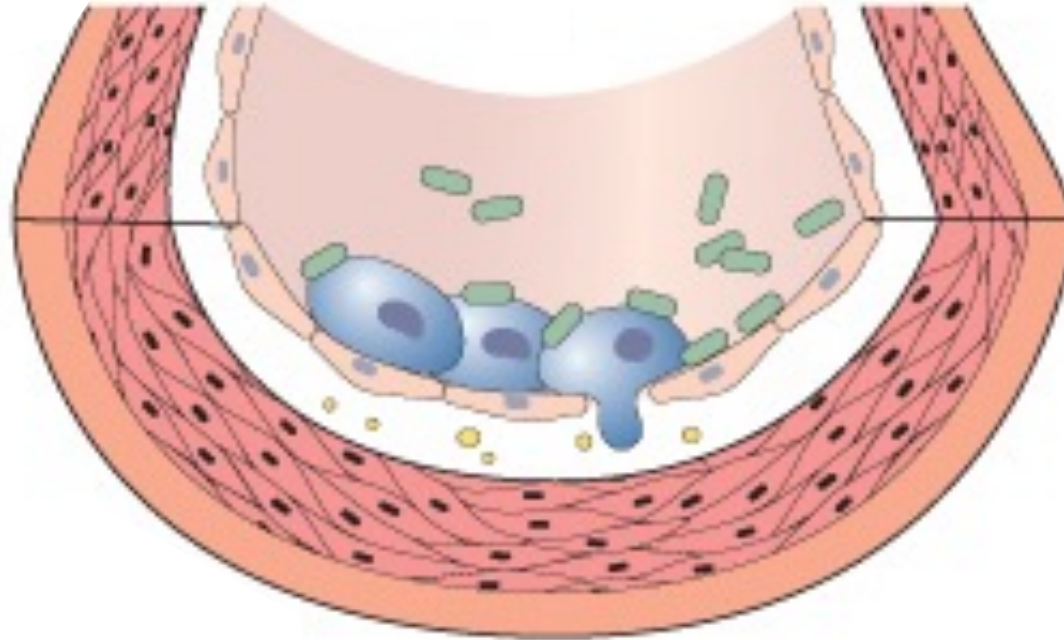
- Inflammation
- Metabolic syndrome
- Obesity
- Lack of exercise
- Stress

How to Make an Atheroma



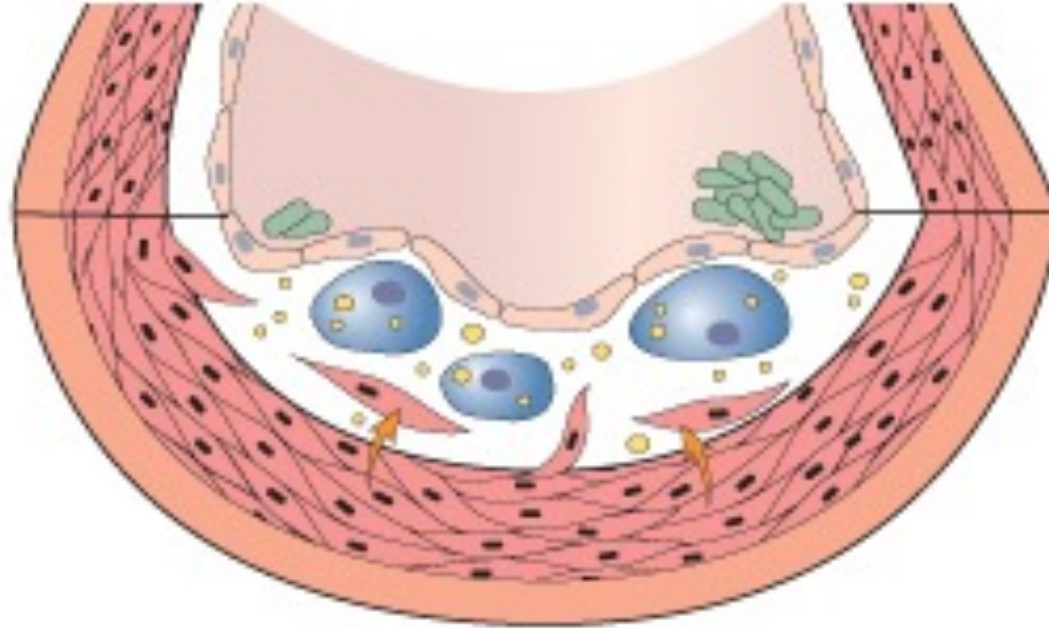
1 Chronic endothelial injury

How to Make an Atheroma



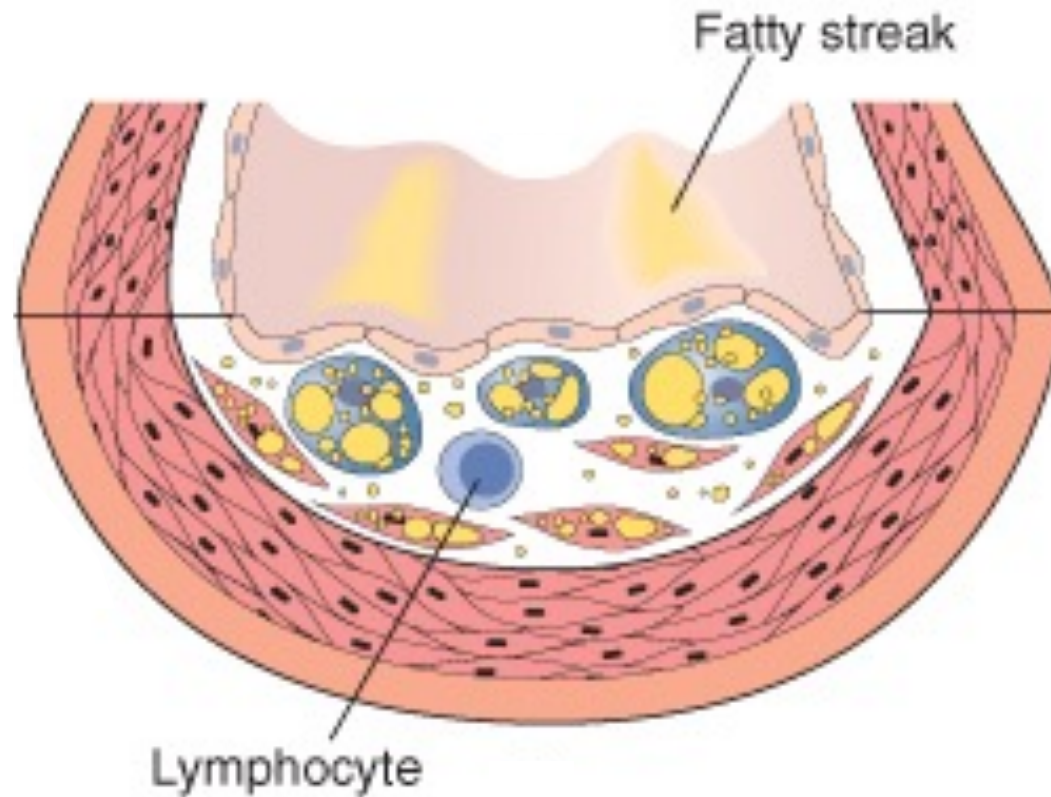
- 2 Endothelial dysfunction
Monocyte adhesion and emigration

How to Make an Atheroma

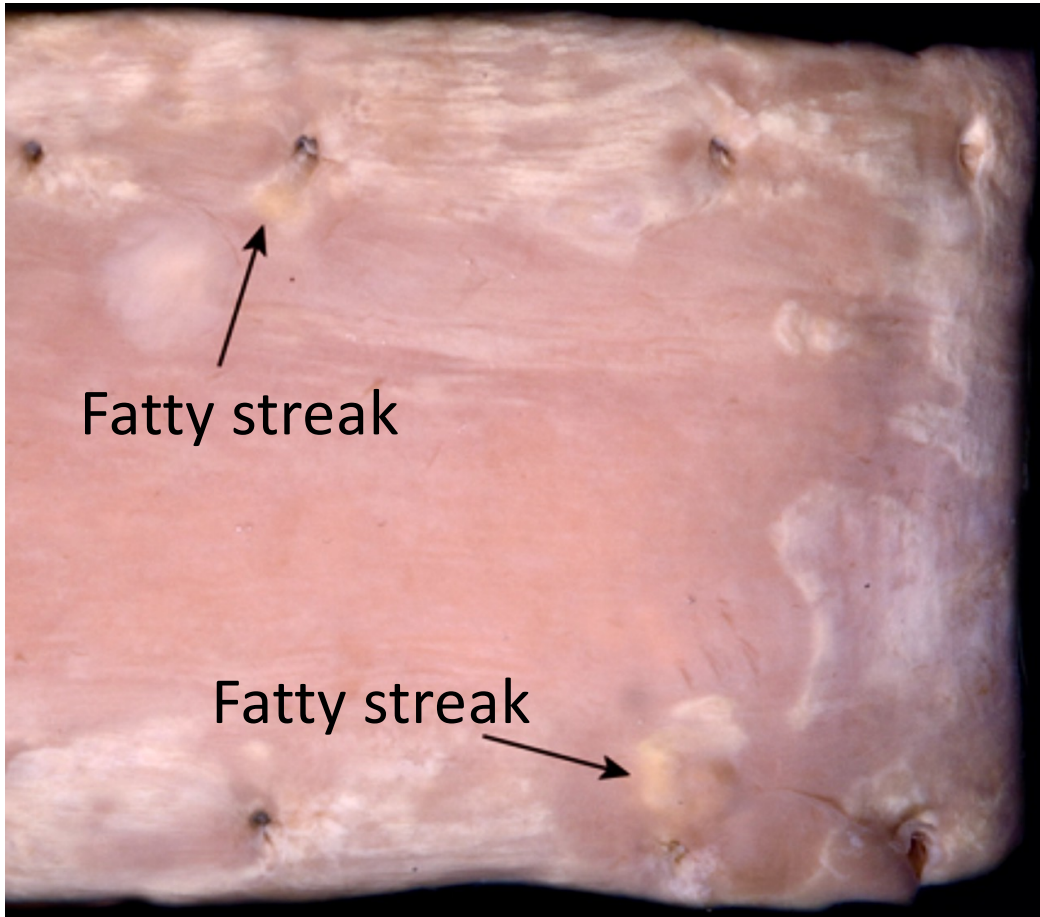


3 Macrophage activation
Smooth muscle recruitment

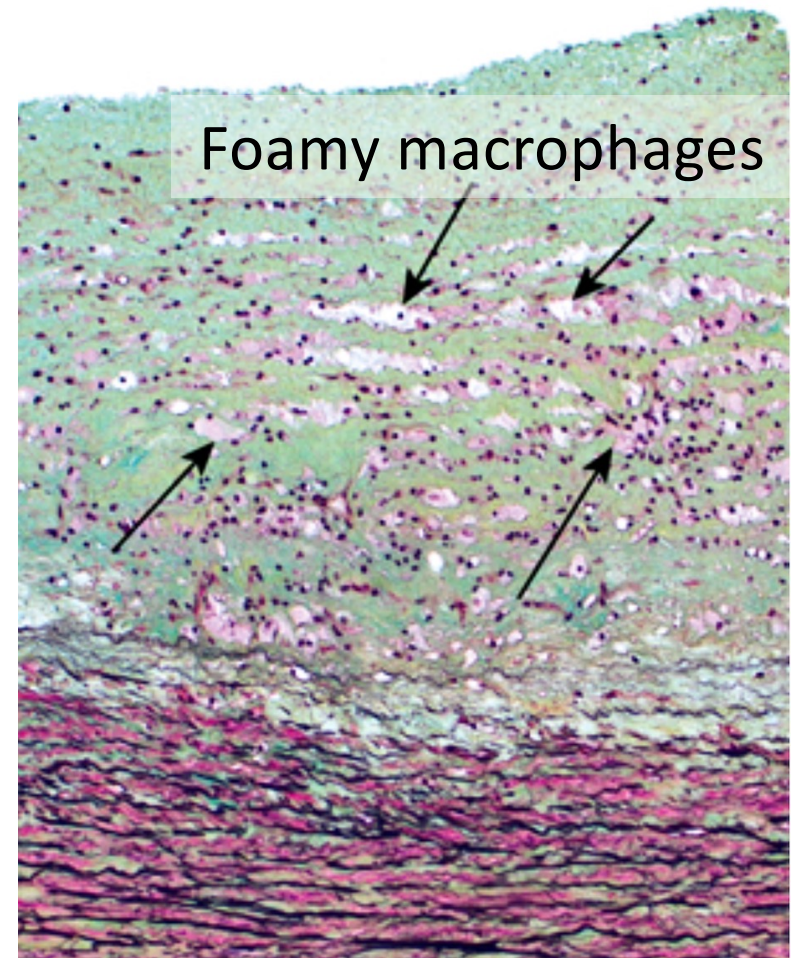
How to Make an Atheroma



4 Macrophages and smooth muscle cells engulf lipid

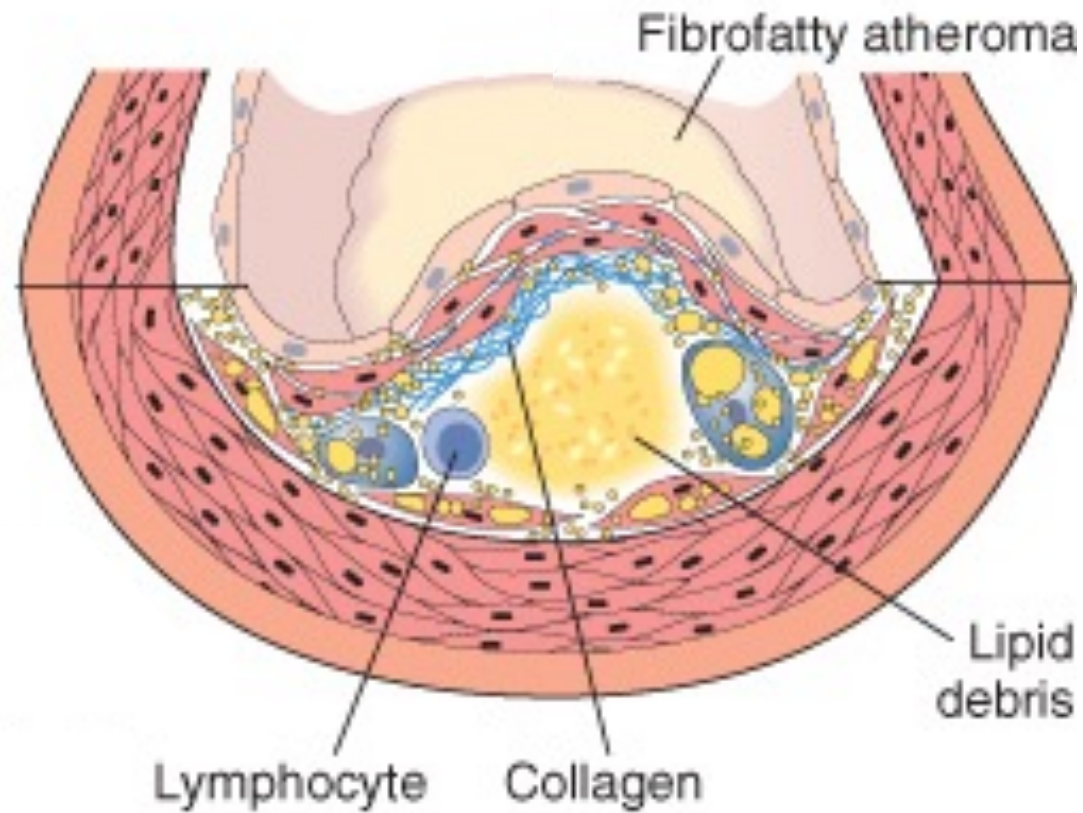


Aorta, gross

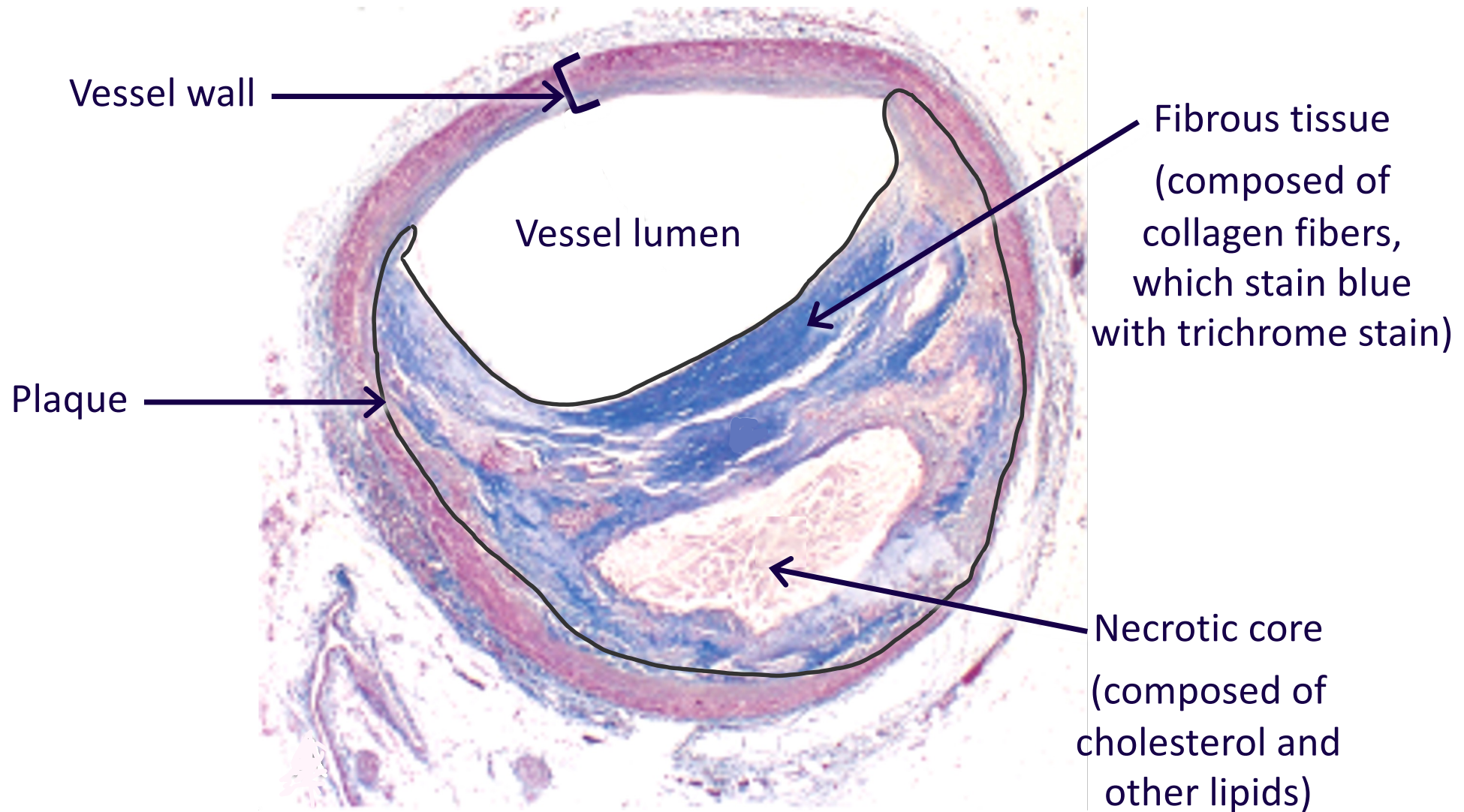


Aorta, microscopic

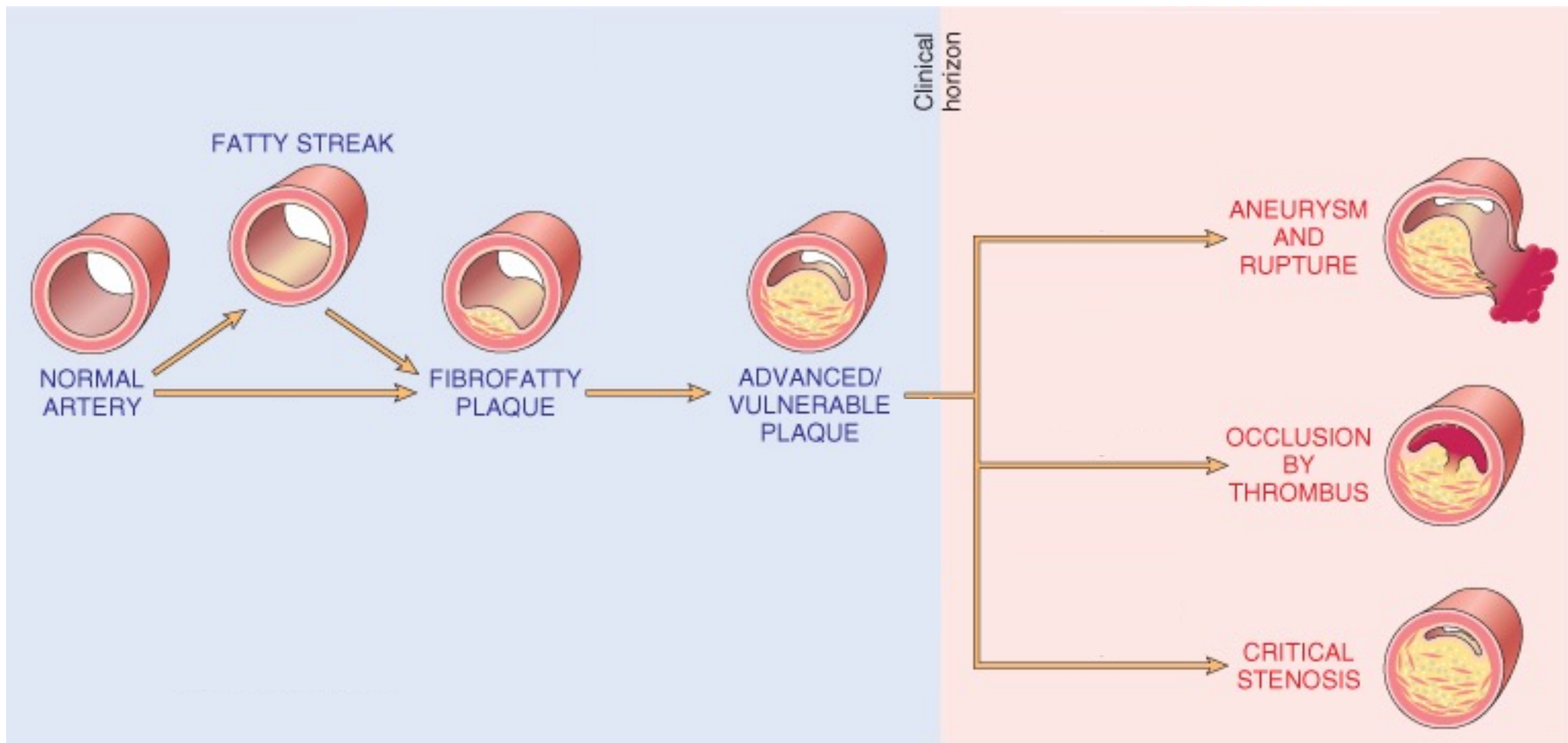
How to Make an Atheroma



- 5 Smooth muscle proliferation
Collagen and extracellular lipid deposition



Atheromatous plaque (trichrome stain)



Natural history of atherosclerosis

Prevention of Atherosclerosis

- Primary prevention
 - Lessen risk factors
 - Statins
- Secondary prevention
 - Aspirin, statins, beta blockers
 - Surgery

Cardiac Pathology Outline

- Blood Vessels
 - Atherosclerosis
 - Hypertension

Types of Hypertension

- Benign hypertension
 - Essential (idiopathic) hypertension
 - Secondary hypertension
- Malignant hypertension

Essential Hypertension

- Common problem (25% of population)
- Asymptomatic until late
- Contributes to coronary artery disease, stroke, cardiac hypertrophy, heart failure
- Mechanisms largely unknown
- >140/90

Essential Hypertension

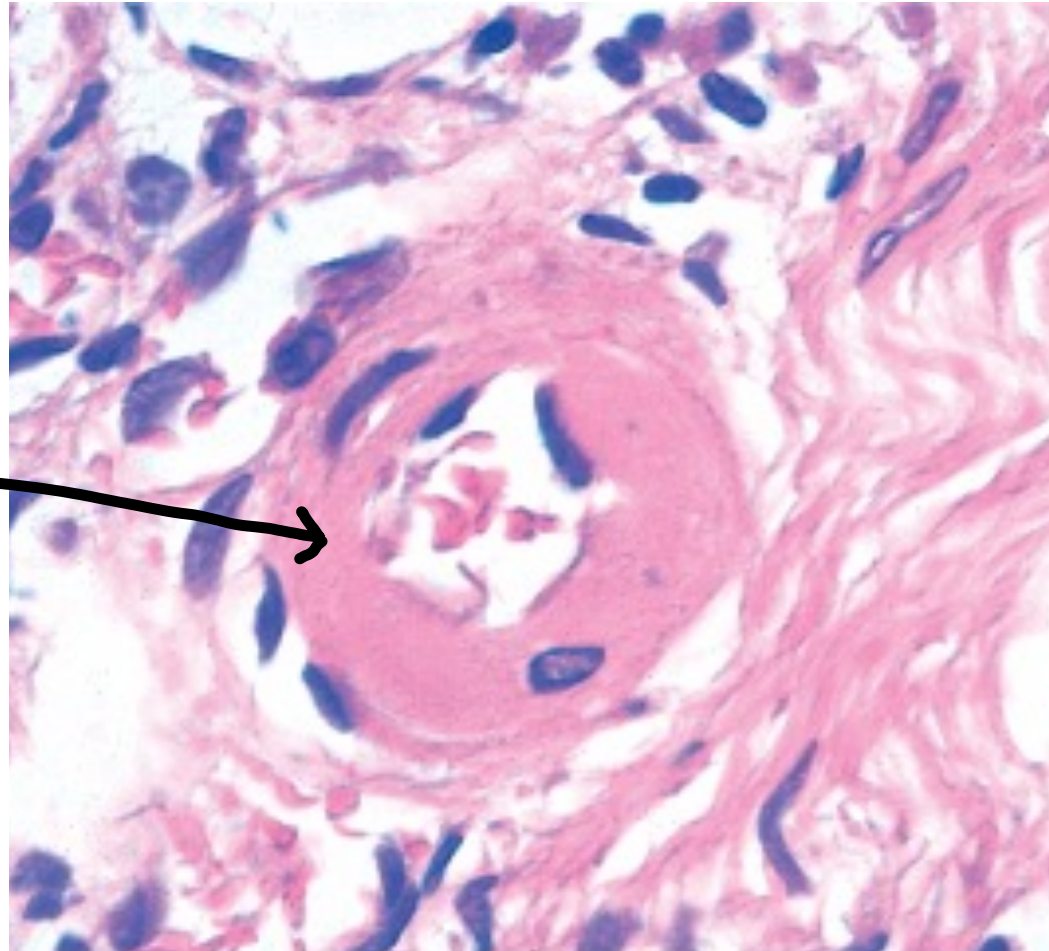
- Idiopathic! But probably related to...
- Reduced renal sodium excretion
- Vascular changes
- Genetic factors
- Environmental factors

Essential Hypertension

Consequences

- Accelerates atherogenesis
- Potentiates aortic dissection and stroke
- Causes small blood vessel disease (hyaline arteriolosclerosis)

Thickened
vessel wall



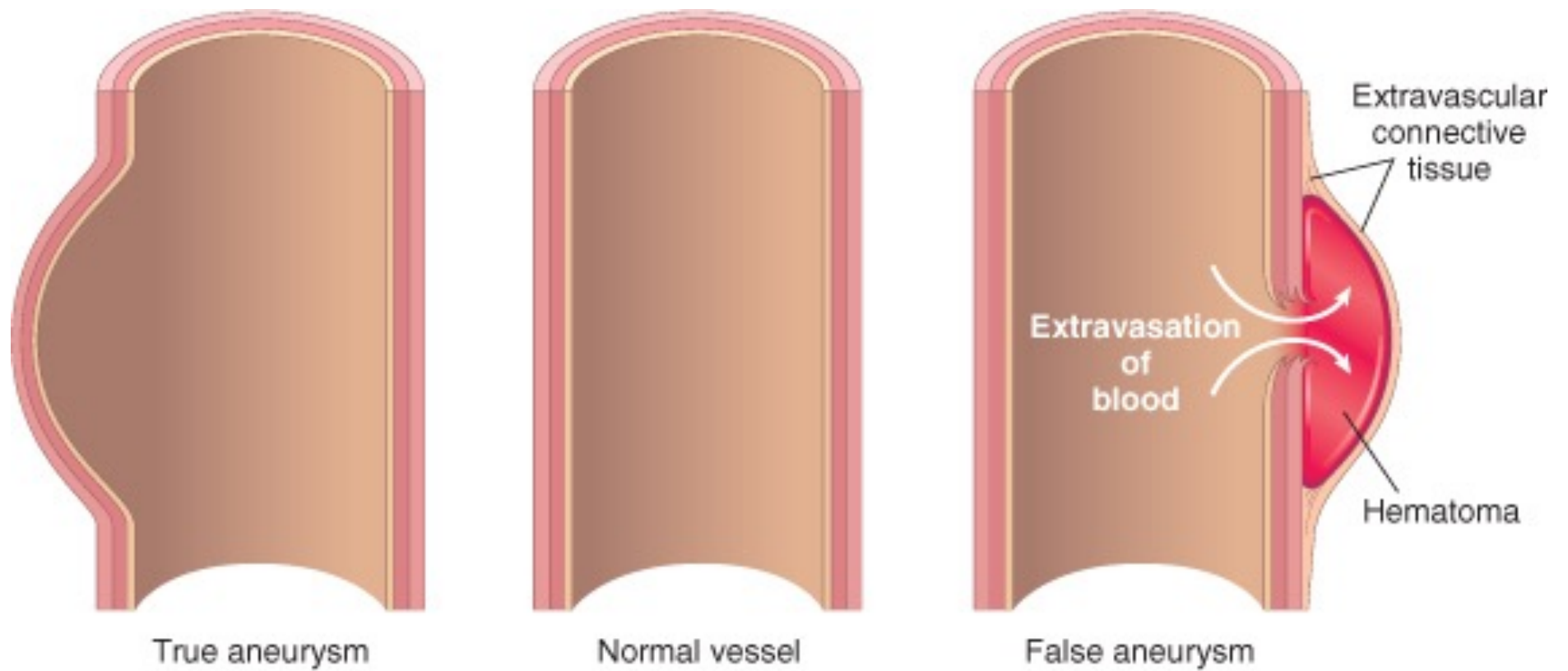
Hyaline arteriolosclerosis

Cardiac Pathology Outline

- Blood Vessels
 - Atherosclerosis
 - Hypertension
 - Aneurysms

Aneurysms

- Aneurysm: localized abnormal vessel dilation
- “True” aneurysm: involves all three layers
- “False” aneurysm: hole covered with hematoma



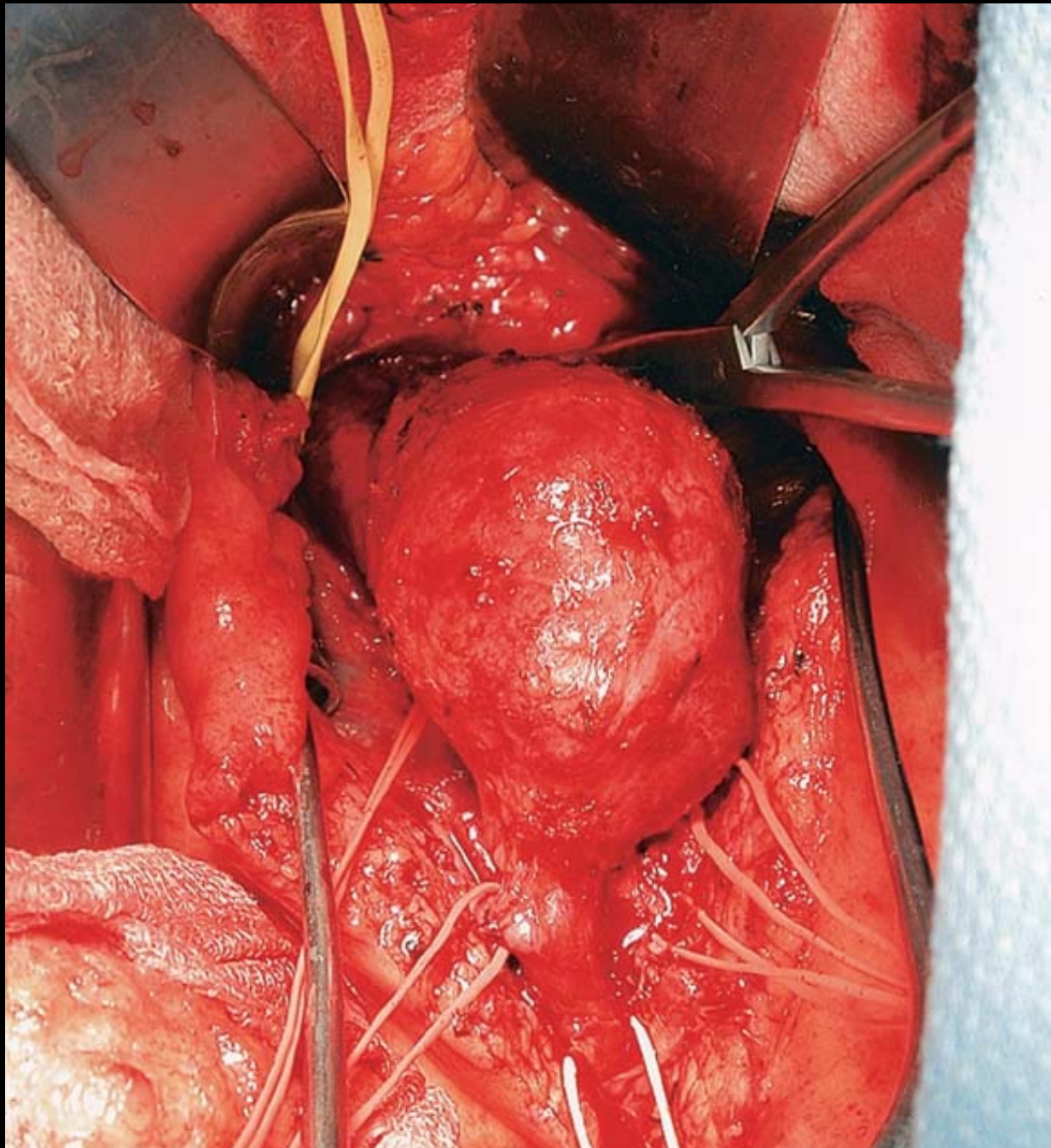
True and false aneurysms

Causes of Aneurysms

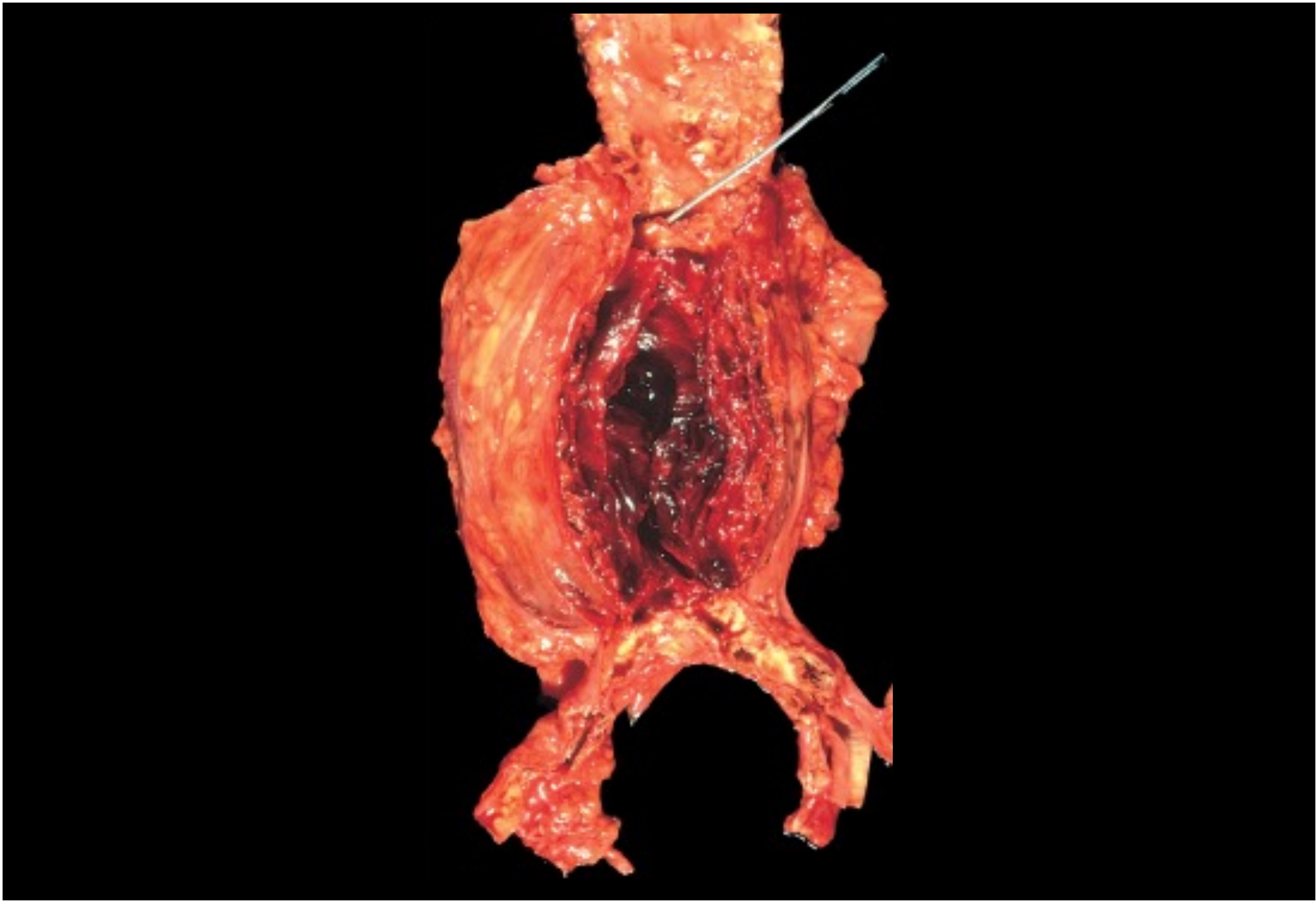
- Atherosclerosis
- Cystic medial degeneration of wall
- Trauma
- Congenital defects (berry aneurysm)

Abdominal Aortic Aneurysm

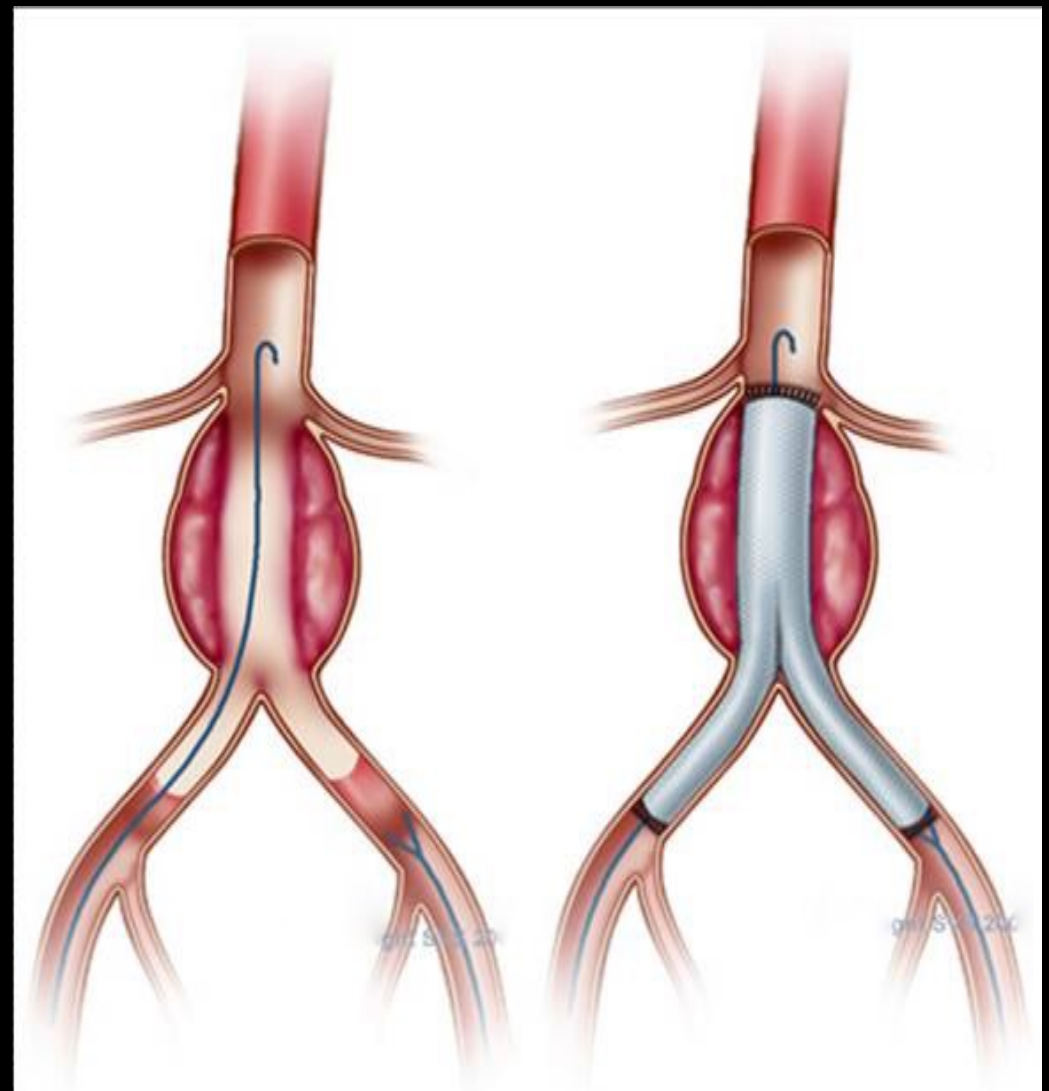
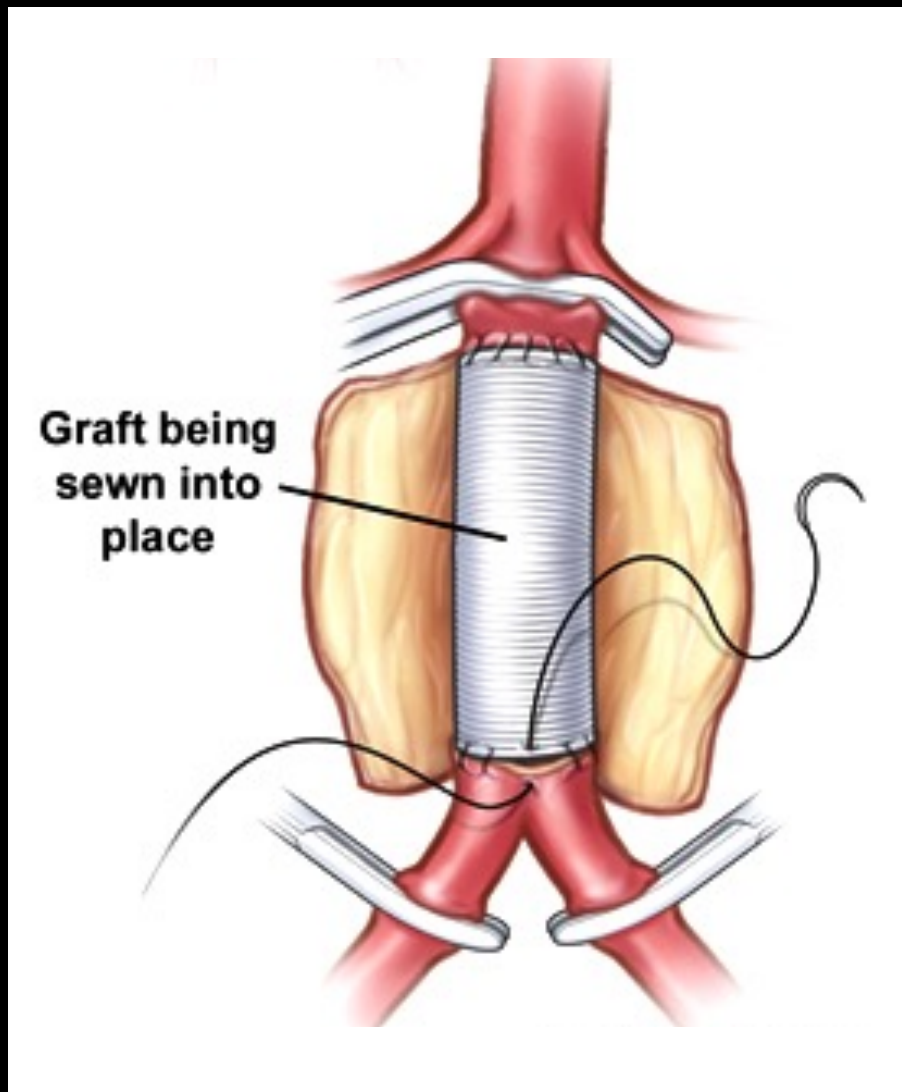
- Males >50
- Atherosclerosis, genetic defects (Marfan syndrome)
- Below renal arteries, above bifurcation
- May present as pulsating abdominal mass
- May rupture, obstruct branches or embolize



Abdominal aortic aneurysm



Abdominal aortic aneurysm



Abdominal aortic aneurysm repair

Aortic Dissection

- Blood tracks up through media, creating a channel
- Hypertensive men, 40-60 (most cases)
- Sudden onset excruciating pain
- Can rupture → massive hemorrhage or cardiac tamponade
- Rapid diagnosis, surgery = 65-75% of patients survive

Cardiac Pathology Outline

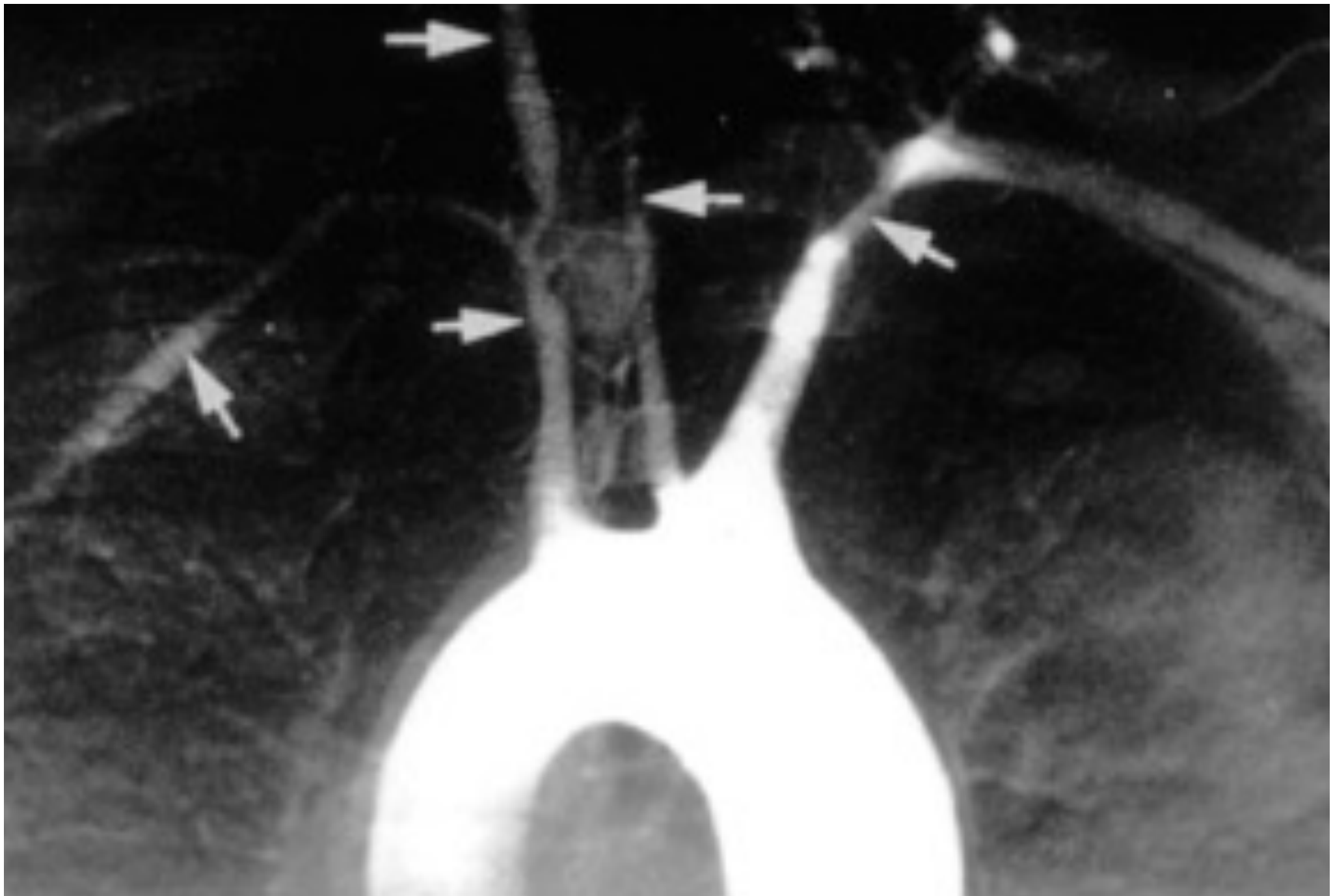
- Blood Vessels
 - Atherosclerosis
 - Hypertension
 - Aneurysms
 - Vasculitis

Vasculitis

- Inflammation of vessel walls
- Many possible symptoms
- Constitutional signs/symptoms common
- Immune-mediated or infectious

Takayasu Arteritis

- Women <40
- Granulomatous vasculitis of aortic arch
- Severe narrowing of major branches
- Weakening of pulses in upper extremities (“pulseless disease”)
- Ocular disturbances



Takayasu arteritis

Kawasaki Disease

- Children <4
- Acute, febrile, usually self-limiting
- Danger: involvement of coronary arteries
- “Mucocutaneous lymph node syndrome”
- Delayed-type hypersensitivity reaction?
- Treatment: intravenous Ig



Kawasaki Disease: hand edema, mouth lesions



Kawasaki Disease: “strawberry” tongue

Cardiac Pathology Outline

- Blood Vessels
 - Atherosclerosis
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 - Aneurysms
 - Vasculitis
 - Tumors

Hemangioma

- Very common benign tumor of blood vessels
- Capillary hemangioma
 - Skin, oral mucosa, sometimes organs
 - “Strawberry” type present at birth, regresses
- Pyogenic granuloma
 - Rapidly growing red nodule on skin, in mouth
 - Microscopically resembles granulation tissue



Capillary hemangioma



Pyogenic granuloma

Kaposi Sarcoma

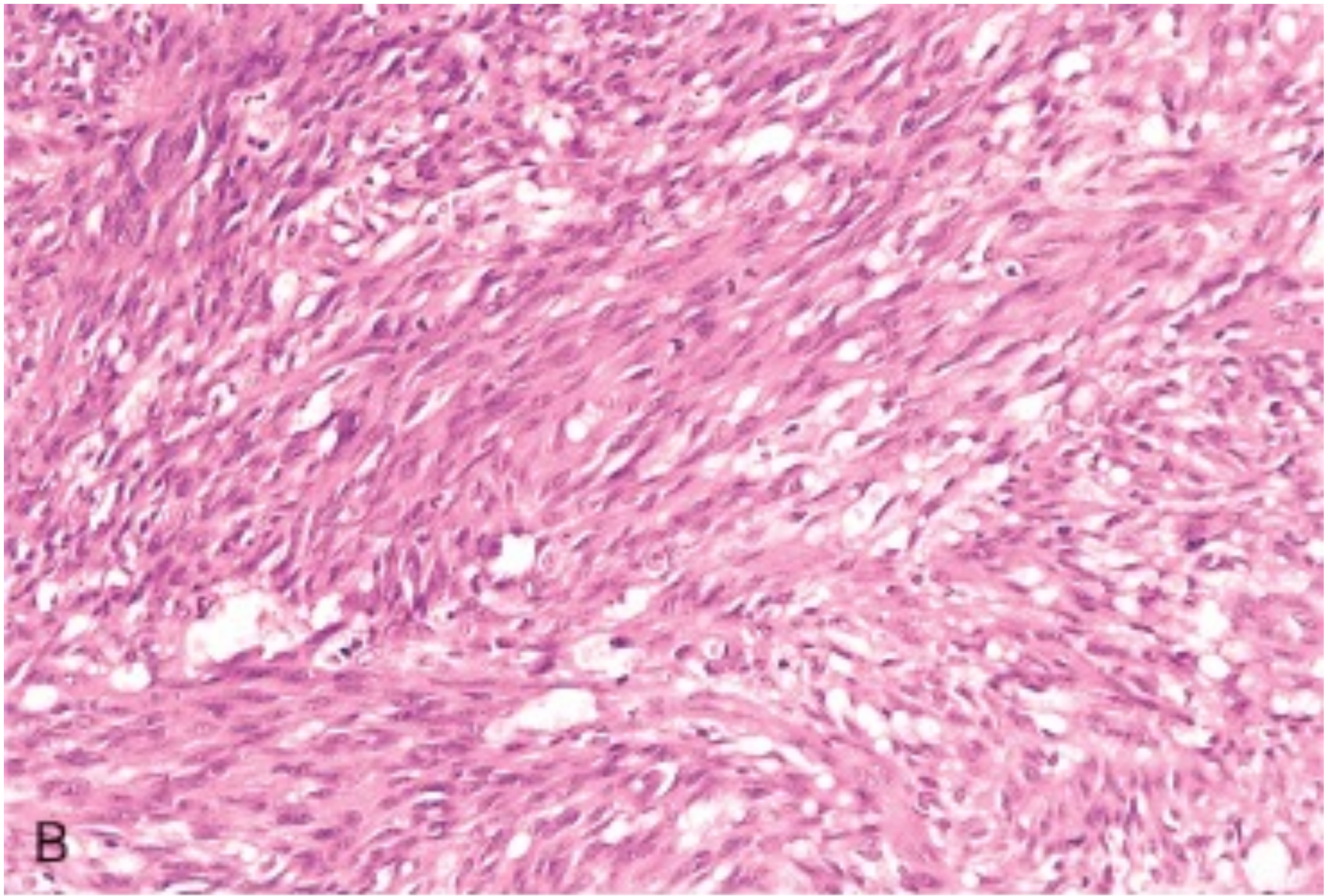
- Low-grade malignancy of endothelial cells
- Four forms: Chronic (older Ashkenazi Jewish males), African, transplant-associated, AIDS-associated
- Clinical course varies (chronic = best)
- Excision can be curative



Kaposi sarcoma



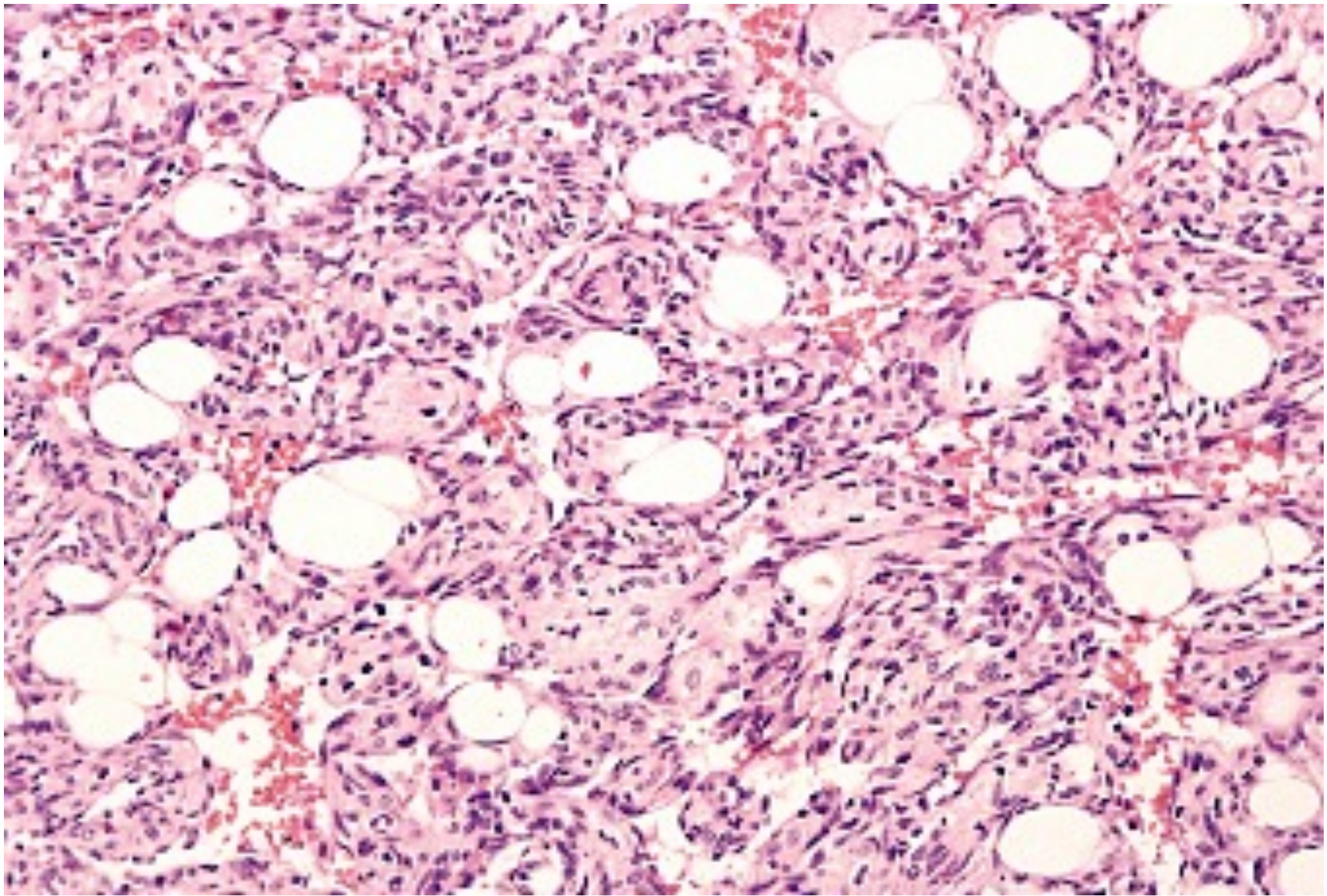
Kaposi sarcoma



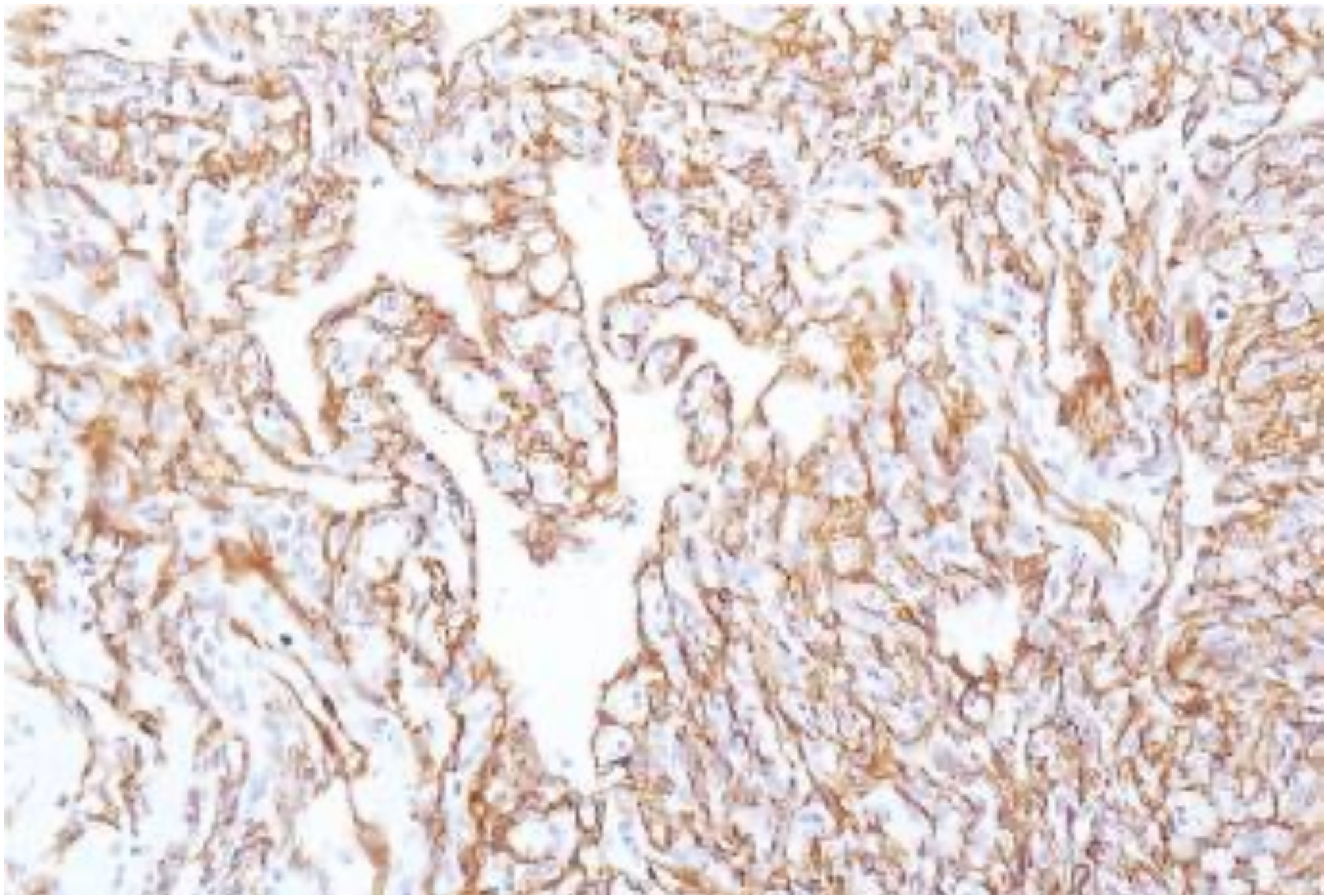
Kaposi sarcoma

Angiosarcoma

- Malignancy of endothelial cells
- Prefers skin, soft tissue, breast, liver
- Arsenic and PVC increase risk
- Well-differentiated to anaplastic
- Metastasize rapidly. 5ys 30%.



Angiosarcoma



Angiosarcoma cells positive for CD31 (an endothelial marker)

Cardiac Pathology Outline

- Blood Vessels
 - Atherosclerosis
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 - Aneurysms
 - Vasculitis
 - Tumors
- Heart I
- Heart II